EXAMEN EXAMINATUM:

OR,

Wing's Examination

OF

ASTRONOMIA CAROLINA EXAMINED.

CONTAINING

An EXPLICATION of some of the Fundamental-Grounds of the said *Astronomie.*

WITH

A CASTIGATION of the ENVY and IGNORANCE of *VINCENT WING.*

By THOMAS STREETE Student in *Astronomy* and *Mathematicks.*

Humanum est Errare, Perseverare Diabolicum.

Imprimatur,

Ex Ædibus Lamb.
Jul. 16. 1666.

Tho. Cooke, *Reverendissimo in Christo Patri & Dno. D.* Gilberto *Archiepisc.* Cant. *Sacellanus Domesticus.*

London, Printed by *John Darby*, and are to be Sold by *John Sellers* Compass-Maker, at the Signe of the *Mariners-Compass* and *Sphere*, at the *Hermitage* Staires in *Wapping*, 1667.

MI - 1990

Bought this of the Widow Street
Sep: 1, 1722. CL

All ſorts of Inſtruments belonging to the Art of Navigation, are to be ſold by *John Sellers*, living at the Signe of the *Mariners-Compaſs* and *Sphere*, at the *Hermitage* Stairs in *Wapping*; where you may be alſo Inſtructed in the Uſe of any of them, by the ſaid *John Sellers*.

MI - 1990

April 28, 1728 I saw and borrowed Wings Examen of Astronomia Carolina; it was printed in the Year 1665 and Contains 40 pages in Octavo, and 5 Sections besides the preface.

Section 1.

Wherein is proved (by the indubitable observations of the best and most Learned Astronomers) that Mr Tho Streets Tables of the Suns true place are not Consentanious to the Heavens, but very considerably differ from the most accurate observations of all ages.

Sect: 2.

An Examination of Mr Streets Tables of Eclipses.

Sect: 3.

Wherein Mr Streets Tables of the Precession of the Equinoctial points and places of the fixed Stars, are briefly examin'd.

Sect: 4.

Wherein is shewed, that if the Aphelions and Nodes of the Planets are always fixed, it's then altogether impossible for Astronomers to determine exactly the true places of the Planets in all ages.

Sect: 5.

Wherein the Cavil of Mr Street (in his Appendix) against our Demonstration of the transit of ☿ sub Sole, is removed. J. C.

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De Autore

AD

Vincentium Wing.

Qui docet errores Lunæ sequiturq; Planetas
Vincenti errores detegit ille tuos.

H. G.

EXAMEN EXAMINATUM:

OR,

Wing's Examination

OF

ASTRONOMIA CAROLINA

EXAMINED.

IN the Title Page of *Wing's Examen Astronomiæ Carolinæ*, we may first take notice, that he termes it a *Mathematical Discourse*: And after his charging me with Errors and Mistakes in my *Astronomia Carolina*, and with *Unjust Aspersions* in my *Appendix* thereunto, he [illegible] his Name, in his accustomary manner, *Vincent Wing Mathemat*. And how he proves all this, I leave to the Just Censure of all Competent Judges; such especially as either [illegible] have been approved Professors of *Astronomy*, or the *Mathematics*. Doubtless had he well considered the following words which he [illegible] down, (*Prius intellige, & tunc increpa*) he might have saved [illegible] labour and discredit of Writing such an *Examen*: And first [illegible]

have

And first of all he should have forborn mentioning Mr. *Horrox* and my self in that Erroneous Discourse near the latter end of his *Almanack* for 1663, with his obstinate and abusive folly in those for 1664, and 1665. But not regarding his rude and evil Language, wherein he hath again sufficiently Characterized himself, as well in the fore-front of his *Preface* to his pretended *Examen*, as generally throughout the rest of that miserable stuffe; my Conscience being clear of all his *Calumniations*, I shall here proceed directly with my intended purpose.

An Examination of Wing's *first* Section.

IN his first Section he saith, *It is proved that Mr.* Tho. Streetes *Tables of the Suns true place, are not consentaneous to the Heavens, but very considerably differ from the most accurate Observation of all Ages.*

He begins with a long confused and insignificant Story of *Parallax* and *Refraction* (a great part of which he had before in his *Almanack* for 1664) and *page* 2, among other Authors he brings in *Kepler* and *Riccioli* to be on his side. But by *Keplers* Hypothesis, the Suns Horizontal Parallax is only one minute, or 60″, as *Vincent Wing* confesseth in the 11th *page* of his said *Examen*; and according to *Riccioli* it is 28″, as may be seen in his *New Almagest*; whereas *Wing* hath hitherto supposed it about 2′, 21″, or 141″.

In the same second *page*, *Tycho Brahe*, Mr. *Edward Wright*, *Kepler*, *Longomontanus*, *Bullialdus*, *Riccioli*, *Eichstadius*, *Argol*, *Gassendus* and *Norwood*, will not serve Mr. *Wing*; but he generally musters up all other the most curious Observators of this and other Nations, except *Thomas Street* alone. But I must tell him, that *Horrox* in his Manuscripts (though perhaps *Wing* never saw them, as he afterward confesseth) hath determined the *Suns greatest Parallax* 14″, and never affirmeth it to be more than 15″. Also *Wendelinus* in his *Luminarcani Eclipses Lunares* hath it 14″. *Hevelius* in his *Mercurius in Sole Visus* agrees with *Kepler*: and lastly *Hugenius*, in his *Systema Saturnium*, for reasons there given, allows for the said *Parallax* but 11″, which is yet less than any of the rest.

But to come to the Observations of *Tycho*, which *Wing* so often (though to no purpose) mentioneth: I say it is manifest that *Tycho* (except in conformity to the Ancients, who wanted fit Instruments for any such purpose) had no other ground for making the Suns Horizontal Parallax 3′, but only

only the Observations of Lunar Eclipses, as in his *Progymnasmata* (*Pars* 1 *pag.* 275. *Edit. postrema*) he acknowledgeth: And although he there accounteth this the surest way; Let us first consider, that in Lunar Eclipses observed by the bare Eye, the duration of the Eclipse seemeth generally more than it is; and the Semidiameter of the Earths shadow, with the quantity of the Eclipse, greater than really they are by about one whole Digit, and sometimes more, as by many acurate Observations made by help of the Telescope, hath been sufficiently proved, and my self hath been often an Eye-witness: But of this the Courteous Reader may at his leasure peruse *Ricciolus*, *Hevelius* and divers others.

And now admit that by the Observations of *Tycho*, the Horizontal Parallax of the ☾ with the Semidiameter of the ☉, had been both exactly known, and the Semidiameter of the Earths shadow gathered by observations of Lunar Eclipses, as above: I say that by the *Diagram* of *Hipparchus* (as it is demonstrated in the 60th *page* of my *Astronomia Carolina*) the sum of the Semidiameters of the Sun and shadow of the Earth, less by the Horizontal Parallax of the Moon, is equal to the Horizontal Parallax of the Sun: therefore by how much soever *Tycho's* Observation of the Semidiameter of the shadow did exceed the Truth, by so much also of necessity must his Horizontal Parallax of the Sun. And hence it will easily appear to the Judicious, that the Horizontal Parallax of the Sun is very small, and rather Insensible, than of any such Proportion as *Tycho*, and all or most of his Predecessors, with their followers in this particular have supposed it.

A second proof of the Insensibility of the Suns Parallax, by the Observation of *Tycho Brahe*, is this;

The ordinary *Refractions* of the Luminaries, Planets and Stars (as we shall anon shew, and have already shewn in our *Appendix* to *Astronomia Carolina*) are demonstratively one and the same: But *Tycho* hath allowed (in a manner) one *Refraction* to the *Luminaries*, and another to the fixt-Stars, which last he makes less than the former by 3 or 4′. And in regard the fixt Stars are wholly exempt from *Parallax*, the difference can be no nearer or otherwise reconciled, then by diminishing at least the *Tychonick Horizontal Parallax* of ☉ as well as his *Refractions* of both Luminaries by about 3′; so that there will remain little or nothing for the Suns true Parallax.

A third Proof and undeniable Argument of the Truth of what is here affirmed, is the *Parallax* of *Mars* in his Acronychial Positures, especially in or near his *Perihelion*; for if with *Tycho* we suppose the *Horizontal Parallax* of ☉ in his mean distance 3′, it follows by infallible demonstration, that the greatest *Parallax* of *Mars* when he is neareſt the Earth is full 8′; or if with *Wing* & those Authors from whom he takes it upon trust we make the mean

Horizontal Parallax of ☉ 2′. 20″, then of necessity must the greatest Parallax of *Mars* be 6′. 20″. But *Tycho* himself, *Kepler*, *Horrox*, and all other accurate Observators have been so far from finding the greatest Parallax of ♂ either 8′, or 6′. 20″, that by comparing all their exactest Observations together, it will be proved upon very good grounds less then 1′. And therefore for reasons which shall here immediately follow, have we determined the Horizontal Parallax of the Sun 15″. and hence the greatest Parallax of *Mars* 40″.

And touching the Tychonick Observations of the Parallax of *Mars* in ♂ to the Sun, he that hath *Keplers Commentaries of Mars* may turn to the 12th and 64th Chapter: But because that Book is more scant to be had, take here the relation of it from *Ricciolus* in his *Almagestum Novum*, Tom. 1. Lib. 7. Pag. 523. Col. 2.

Ita Keplerus diligentissime hæc loca perlustrans, & volumen Tychonicarum Observationum perlegens, affirmat perexiguam esse Martis parallaxim licet Perigæi, majusculam tamen Solari & utramque vix sensibilem esse; & Eclipses Solis exigere ut Parallaxis Solis sit ferè nulla. Ita docet Keplerus *in Ephemerid.* pag. 2. *& in Epitome Astronomiæ Copernicanæ*, pag. 479. *& in Marte* [illegible] Cap. 11 & 64. *ubi hoc probat. Primo quidem quia in eo Tychonis volumine adnotatum est manu Tychonis nonnunquam* in contrarium rem recidisse *hoc est Contrarium effectum inventum aliquando ex observationibus, quam requireret Parallaxis Martis Solari major; Deinde quia Parallaxis Martem retrogradum debet vespere projicere in Ortum, mane autem cadentem projicere in Occasum, & sic motum diurnum retrogradum accelerare: quare si sentitur ejus parallaxis prope situm achronychium, quando scilicet est retrogradus, oportet ut motus retrogradus, nimis auctus sentiatur. At examinatis diurnis motibus post primam stationem, & tempore retrogradationis ex observationibus Brahæanis* Anni 1582. à Die 23. & 24 Novembris, *qua distantiæ à Fixis motus retrogradus aut nihil auctus, aut vix sensibiliter, aut etiam diminutus aliquando repertus est. Ergo Parallaxis Martis quamvis Perigæi aut nulla, aut vix sensibilis est.*

And for farther Demonstration of the small and almost inobservable proportion of the Suns Parallax, many other sure proofs might be here produced, as the Telescopical Observations of the Moons *Dichotomies*, and also of the Diameters of ♄, ♃, ♂, ♀ and ☿, made by *Ricciolus*, *Wendelinus*, *Horrox*, *Hugenius*, *Hevelius* and others.

Also in Refutation of that silly Censure of *V. W.* in the bottom of his second Page, and other of his Ignorant and Wilful Errors, I could produce several Observations which I have made far more exactly then to that quantity he there dreams of, by an invention of mine own, which may possibly hereafter (to the benefit of diligent Observators) be made publick.

But

But here I shall only compare the Visible Semidiameters of the six Primary Planets to an Eye supposed at the Sun in their mean distances from him, equal to the Horizontal Parallax of the Sun to an Eye supposed on the superficies of each Planet, which as I have deduced them from the accurate Observations of *Hugenius* and *Horrox*, are as followeth.

The Mean Horizontal Parallax of the Sun to an Eye supposed on the Superficies of	*Saturn*	$10''\frac{1}{2}$
	Jupiter	24
	Mars	4
	The Earth	15
	Venus	$14\frac{1}{2}$
	Mercury	23

By the Telescopical Observations of *Hevelius*, the visible Semidiameters of ♄, ♃, ♂, ♀ and ☿ are all of them less then by our determination in *Astronomia Carolina, pag.* 61, Where the Apparent Semidiameters of ♀ and ☿ are at the Earth in their mean distances $10\frac{1}{2}$, and $5''$, and therefore at the Sun $24\frac{1}{2}$, and $13''$, and the mean Semidiameters of ♄, ♃, and ♂, both in respect of the Earth and Sun as above.

And now for trial of the Truth, suppose that the Semidiameter of the Earth should appear at the Sun $20''$, that is $5''$ greater than by our estimation; then will the Body of the Earth exceed the Body of ♀ 64 times, and consequently this Primary Planet ♀ will be of a less Magnitude then our Secondary Planet the Moon, which is not consentaneous unto reason. Again, let us suppose the Semidiameter of the Earth to an eye placed at the Sun $10''$, that is $5''$ less then we have limited it; then will the Magnitude of the Earth be somewhat less then ☿, which is contradictory to the Harmony of Magnitudes published in my *Appendix*. And therefore, according to Observation, Reason and Harmony, we conclude that (to an eye placed on the Superficies of our Terrestrial Sphere) the Horizontal Parallax of the Sun is exactly enough $15''$.

But *Vincent Wing* contrary to all indubitable Observation, Harmony, or Reason, will have the Mean Horizontal Parallax of ☉, or the greatest Angle at his Center subtended by the Semidiameter of the Earth in her mean distance $2'.21''.$ or $141''$: and hence of necessity must the Body of the Earth be greater than any other Primary Planet; greater than *Mars* 12318 times; greater then *Venus* 2422 times; and greater then *Mercury* 12426 times. And our Moon also, though a secondary Planet, and less then the Earth 51 times, shall be by this account greater then *Mars* 242 times, greater then *Venus* 47 times, and greater then *Mercury* 440 times.

And

And here to make clear Work, I must needs take a little notice of some other of *Wings* most notorious absurdities in the first Section of his pretended *Examen*; as in *page* 3, where he promiseth faithfully to compare the Tychonick Observations of the Suns place with my Tables, and yet afterwards faithlesly doth it by a *false Parallax*, which I have as well formerly as here disowned and refuted.

Page 4. That I never so much as consider the *Crassitude* (forsooth) of the *Aereal Sphere*, at least not according to the Rules of Art, and (upon this account) in the 76th *page* of my Book have quite lost my self: But this *Crassitude* is about the ♂ of ☉ and ☿, Observed by *Horrox*, *Anno* 1639, with which I find *Wing* so often troubled, that I doubt I must anon use my farther endeavours to cure him of it.

Page 5. (Besides *Hic niger est*, out of *Horace*) he saith, that by reason of *Refraction*, those Observations of the Suns true place made by the Ancient Astronomers must needs come much short of truth, and is so unreasonable as to add, that this may be a good *Monitum* to Mr. *T. S.* But why then (say I) doth *Wing* omit *Albategnius* his Observations of both *Æquinoxes*, gathered from the true place of ☉ in the Meridian, when he was freed from all sensible *Refraction*? Is it not because they agree far better with my Tables than with his? and as for the Observations of *Hipparchus*, I have shewn in the 94th *page* of my *Astronomia Carolina*, that their greatest difference from my Tables, as also amongst themselves, may be easily reconciled by *Refraction*.

In the 6, 7, 8, 9, and most part of the 10th *page*, *Wing* learnedly informs us, what great *Refractions* of the *Luminaries* and also of *Venus* have been observed by *Mœstlin*, the *Lantgrave* of *Hessen*, and *Bernard Walther*; with (observe it Mr. *Strette*) that the Stars do appear above the Horizon when according to their true place they are under it: Yes indeed! and moreover that it so happened (through the *Crassitude* of the *Æreal Sphere*) that upon the 24th of *Jan.* 1597, the *Hollanders* near *Nova Zembla* Observed the Suns *Refraction* above 3 degrees and an half: And also that in the year 1632 in *February*, *Capt. T. J.* Wintering in an Island of *America*, found it almost 3 degrees.

And who denies these Observations, I know not; but am well assured that no wise Man can understand by them, or otherwise, how ☿ *in the same Altitude, and through the same quantity of Vapours, should be more Refracted than any other Star*; neither that those extraordinary *Refractions* (if they had been yet greater) should make any thing at all for *Wing*, or against Me, as touching the Suns Horizontal Parallax.

Page 10. He relates the words of *Kepler* in *Epit. Astron. page* 479.

Atque

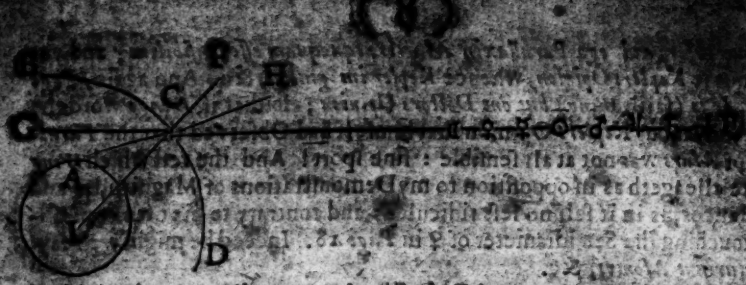
Atque observavi ego Parallaxin Martis nequaquam esse sensibilem; and yet termes it *Keplers Opinion*, whence *Kepler imagineth*, &c. And again, *Page* 11. *It is* (saith *Wing*) *but one Doctors Opinion*; so that if *Wings* words be true, it was but *Keplers* Opinion that himself had Observed that the *Parallax* of *Mars* was not at all sensible: fine sport! And the rest which *Wing* there alleageth as in opposition to my Demonstrations of Magnitudes and Distances, is in it self no less ridiculous, and contrary to his own confession touching the Semidiameter of ♀ in *Page* 18. Indeed he might well say, *Parturiunt Montes*, &c.

Page 12 His experiment of *Refractions* is very ordinary, and published by *Metius* in his *Universa Astronomia Institutio*, and *Page* 13 that of two pieces of Silver in a Bason is no other than what is commonly made by a straight stick put into Water, and no more to his purpose than his Diagram in *Page* 14. which at best only shews that *the nearer the Horizon the greater is the Refraction*. And here his abusing & curtalling of my words concerning *Refractions* (that so he may make them as senseless as his own) shall not serve his turn; but now touching his *Crassitude* of the *Aereal Sphere* and the visible ☌ of ☉ ♀ *Anno* 1639. We shall observe his *unreasonable conclusion* in *Page* 15, *viz.* That though by his Tables ♀ was at that time not onely wide of Eclipsing the Sun, but free from his Contact, yet *because the Center of* ♀ *was more Refracted than the Center of the Sun, there must necessarily be a contact*: O Miserable!

But this absurdity not yet fitting his purpose, he must again juggle it into an Eclipse; and therefore (to increase the ignorance of such as will believe him) he there addeth this farther nonsence; *Besides we read in Authors* (*as you may see above*) *That* ♀ *more than any other of the Planets, hath been very prodigiously Refracted in and about the Horizon, yet we stand not here in any need of such Refractions*; And so in *Page* 16 he runs on with it until he comes to his *Jubeo stultum esse libenter*, the application of which he might very well have kept to himself; for who but *Vincent Wing* ever supposed that Refraction should cause a Visible, if there were not a Real Interposition of ♀, ♀ or the Moon between any part of the Suns body and our sight?

But though the insignificance of these trumperies hath been already demonstrated in my *Appendix*; yet that *Wing* may hear farther as well from some other as from me, *Scheiner* in his *Refractiones Celestes*, *pag.* 133 & *ult.* thus confutes him.

Sir



Sit Oculus in superficie terræ A, Atmosphæra B C D, radius in eam incidens E C, quem vel simul vel successivè projecerint adpicta sidera; ☾, ♀, ☿, ☉, ♂, ♃, ♄ & ✱ quævis firmamenti dico eandem semper fore refractionem, quamdiu invariata manet Atmosphæra.

Est enim idem Angulus incidentiæ E C F, ergo & idem angulus Refractionis A C G, sive E C H. Ergo eadem est refractio.

And hence we may justly infer, that in the famous Observation of *Horrox*, *Anno* 1639, the body of ♀ and that part of the Sun which she then Eclipsed were equally Refracted; and so let the Refraction be what it would (though *Horrox* by the *Suns setting* Observed it to be no more than ordinary) there was a real Immersion of ♀ within the visible *Discus* of the *Sun*, and that appearance by no means caused by Refraction.

Page 16 *Wing* comes to the Parallax of ♂ in his *Acronychial Phases*, and in the top of *Page* 17 he saith, that the greatest quantity thereof according to his limitation is onely 2 or 3 minutes; and whether this be true or false we may thus easily prove by his own Tables, in which the least distance of ♂ from the Sun is 138, such parts as the mean distance of the Earth is 100; (but in this Age) when ♂ is *Perihelion* and in ♌ to ☉, the distance of the Earth from the Sun at that time is 101 of the same parts: Therefore out of 138 substract 101, there remaineth 37 parts for the least distance of ♂ from the Earth; and then (with sufficient exactness) it will follow by the Rule of Three, that as 37 to 100, so is 141″ the mean Horizontal Parallax of the Sun, to 381″ the greatest Parallax to ♂, that is 6′ 21″, and not 2 or 3′ as *Vincent Wing* untruly, and to cloak the absurdity of his Tables, alleadgeth.

The rest of his 17th *Page* is most part about ♀, and to shew how uncertain, yea, and impossible a thing it is to determine a business of such weight and importance (as he knowes not what) from the Conjunction of the Sun and *Venus*. And *Page* 18 the Semidiameter of ♀ in her mean distance is according

according to A.B, 12″, and what the Semidiameters of ♄, ♃, ♂ and ♀ must be, who knows? I believe we must look for them in his A. B. But however it seems the Horizontal Parallax of ☉ is either 2′, 21″, or 3′, or what *Vincent Wing* pleaseth; for in *Page* 19, he saith, he can shew that 'tis altogether impossible to determine it just 15″ and no more.

And according to this his Learned Hypothesis, he abuseth his Reader with those pretended places of the Sun in his 20 and 21 *Pages*, which by false and disproportionable Parallaxes are erroneously deduced from the Observations of *Tycho* and Mr. *Edward Wright*, those (Some) of *Tycho's* being pickt out for his purpose, and all most Inartificially compared with my Tables, as by the 97th Page of my *Astronomia Carolina* will plainly appear: For Example;

Anno 1582, *March* the 14th. at *Uraniburg*,

		°	′	″
The Meridional Altitude of the Sun was by the Observation of *Tycho*		35	22	30
The Parallax of ☉ in that Altitude, Add				12
The Sum is the true Altitude of ☉		35	22	42
The Altitude of the Æquator, Subtract		34	5	30
Rests, The Declination of ☉ North		1	17	12
Which with the Obliquity of the Ecliptick		23	30	0
Gives the true Place of ☉ by Observation	♈	3	13	41
But the true Place of ☉ by my Tables is	♈	3	13	12
The Difference		0	0	29

Here *Wing*, taking it for granted that the Horizontal Parallax of ☉ is about 3′, will have his place observed in ♈ 3°17′40″. But I have already Demonstrated the falsity of that, and consequently of this, with the rest of those pretended Observations of the Suns place, and have also proved that the greatest Parallax of ☉ is exactly enough 15″. So that those considerable Differences and Errors in the Suns true place, which he unjustly and præstigiously imposeth on my Tables, are really & essentially his own.

I shall add the true *Place* of the *Sun*, according to 12 Accurate Observations of his Meridional-Altitudes, made by Mr. *Edward Wright* at *London*, *Anno* 1597, faithfully computed, and compared with *Astronomia Carolina*.

1597. Mens. die.	Alt. ⊙ Obser o. ′. ″	Cor. per par. o. ′. ″.	Declinatio. o. ′. ″	Loc. ⊙ Obser s. o. ′. ″	E. Tab. Nost.. s. o. ′. ″	Differ. ′. ″
Martii. 11.	38.49. 0	38.49.12	B.0.21.12	♈ 0.53.10	♈.0.53.21	†0.11
12	39.13. 0	39.13.12	0.45.12	1.53.22	1.52.39	—0.43
13	39.36.30	39.36.42	1. 8.42	2.52.21	2.51.56	—0.25
14	40. 0.00	40. 0.12	1.32.12	3.51.22	3.51.12	—0.10
April. 30	56. 9. 0	56. 9. 8	17.41. 8	♉19.37.44	♉19.38.16	†0.32
May 2	56.40. 0	56.40. 8	18.12. 8	21.34.16	21.33.46	—0.30
Julii 24	56. 1.30	56. 1.38	17.33.38	♌10.49.49	♌10.50.34	†0.45
Aug. 9	51.16. 0	51.16. 9	12.48. 9	26.14.24	26.13.20	—1. 4
Sept. 22	34 50. 0	34.50.12	A3.37.40	♎ 9. 8. 9	♎ 9. 8.39	†0.30
30	31.44.30	31.44.43	6.43.17	17. 4. 8	17. 3.56	—0.12
Octob. 6	29.29. 0	29.29.13	8.58.47	23. 2.38	23. 1.52	—0.46
12	27.19. 0	27.19.13	11. 8.47	29. 0. 0	29. 1. 2	†1. 2

I could likewise here shew the near agreement of my Tables with all Mr. *Wright's* Observations (extant in his Correction of the *Errors of Navigation.*) But by these (which I formerly published with an *Ephemeris* for 1663.) the rest of *Wings Gulleries* in the latter end of this *Section* are sufficiently demonstrated.

An Examination of Wing's *second* Section.

Page 22. In his second Section, *Wing* (having come off thus gallantly as you see in his first, of which he hopes the Judicious are fully satisfied) will next shew the Reader the gross Errors of his Antagonist in the *Doctrine* of Eclipses: And for this purpose in *Pag.* 23 doth exhibit 21 Lunar Eclipses from the Observations of *Tycho Brahe*, which without doubt (saith he) are the most exact that any Age ever before afforded.

That *Tycho's* Observations were generally more exact than any other extant before his time, I shall in no case deny; But since the case hath been much altered, as all Men of any Judgment that have made use of the Telescope in the Observations of Lunar and Solar Eclipses can testifie.

We are farther here to take notice, that the Apparent Times of those 21 Tyconick Observations of Lunar Eclipses which *Wing* in *Pag.* 23 makes use of,

of, are (without doubt faithfully) set down by *Tycho* himself in his *Progymnasmata*; but *Wing* takes them according to the after-relation of *Longomontanus*, who more then once hath been found retching of other Observations to his Tables, as well as some of these 21 Eclipses, of which I shall here produce six for an Example.

Temp. App. Medii Eclipsis Uraniburg. Tychon.	d	h	′	*Longom. & Wing.* h	′	*Diff. a Tycho.* ′
1576. *Octob.*	7.	11	32	11	25	— 7
1578. *Sept.*	15.	13	17	13	24	+ 7
1587. *Sept.*	6.	9	16	9	30	+ 14
1592. *Junii.*	14.	10	16	10	20	+ 4
1594. *Octob.*	18.	19	26	19	16	— 10
1596. *April.*	2.	9	29	9	25	— 4

But if (as *Longomont.* saith he hath done) the middle of each Eclipse be reduced to the true ☍ of ☉ and ☽ in her Orbite; then by the Observation of *Tycho* will the time of the true ☍ in the third of these 6 Eclipses be $9^h. 13'$, and in the last $9^h. 33'$, and hence the Difference in the third is $+ 17'$. in the last, $-8'$.

And thus by the Observations of *Tycho* alone, are the Errors and false Pretences of *Vincent Wing*, touching that ostentatious shew which he makes of his Tables of Eclipses, most clearly evinced.

But in my *Astronomia Carolina* and *Appendix* thereunto, I have given a faithful account of 43 Lunar Eclipses, *viz.* those 21 of *Tycho*, 1 of *Longomont.* and 21 other by the benefit of the *Telescope* more exactly observed than the former; by which latter 21, *Vincent Wing* might better and with more certainty have Examined his Tables, as I have already done mine; But by this means, in the Time and Quantity of Eclipses, the Notorious Errors, as well of his New Tables, as of his Old already extant, would have been manifestly discovered.

And to that which followes in *pag.* 24, concerning *Tycho's* many accurate Instruments; I answer, that had *Tycho* been but furnished (as he never was) with a Telescope, to see the true Beginning, Quantity and End of those Eclipses, then would one of his very ordinary Quadrants have well sufficed for taking the time by Altitudes.

Next, I would know what reason *Wing* hath given or can give that his Tables of the Suns Place are not already sufficiently refuted; and with what

modestly he can require a Submission to his Ignorance, or pretend to shew and teach me that which himself doth not rightly understand, or to make such Corrections as I very well know, and have long since (otherwise and far more exactly then by any of his miserable helps) performed.

But for *Wings* accusations of self-conceipt and pride, I wish he were less guilty of these Crimes himself, and can assure him that I have written this little out of that honour and great respect which I owe unto Truth, and not for any pride that I take in confuting of him: And for matter of mocking and jeering, if I have any way abused him; let all that are impartial judge.

For Conclusion to this Section;

First, I say my Lunar Theory in *Astronomia Carolina* is more Geometrical then any yet published by *Vincent Wing*, and if compared as well with other Observations as *Tycho's*, it will generally be found more consentaneous to the Heavens.

Secondly, Whereas in *Astronomia Carolina* in the second Page of my Preface to the Reader, I affirmed I could proceed in the Theory of the Moon to a farther degree of exactness, I have since made it appear to several Judicious Persons of good note, that by Gods assistance it is really effected; so that by the Observations of *Tycho*, and of others most accurately made since his time by help of the Telescope, the true place and motion of the Moon in Eclipses and at all other times, with her whole *Phænomena* is verified: And upon this doth the Discovery of the true Longitude depend, of which the Courteous Reader may be pleased to see my Proposition in the beginning of my before mentioned *Appendix*.

An Examination of Wing's *third* Section.

WE are now come to *Sect.* 3. *Wherein* (saith he) Mr. *Streets Tables of the Præcession of the Æquinoctial Points are briefly Examined.*

And first in *Pag.* 25. *Wing's* Assertion, or rather Aspersion is, That if we look backward to the time of *Hipparchus* and *Tymocharis*, we may not only in their times, but in all the intermediate Ages to this present, perceive them to swerve continually from truth.

His chief proofs are in *Page* 26. *viz.* That those places of *Spica Virginis*

nis and *Cor Leonis*, as they are related by *Ptolomy*, and cull'd out by *Wing* for his purpose, do differ more from Mr. *Streets* Tables then from his by about one whole degree.

To which I thus easily Answer.

First, That those Observations were very uncertain, as by *Page* 22. of *Astronomia Carolina* may appear.

Secondly, The Notorious Errors of *Ptolomy* in his pretended accurate Observations of both Æquinoxes, do argue that those of the Fixt-Stars may be yet much greater.

Thirdly, In *Astronomia Carolina*, from *Pag.* 104 to 110. I have proved my Præcession by Observations more certain and of as great Antiquity; and also there, and in *Pag.* 24. of my *Appendix*, by other Ancient Observations since *Ptolomy*, which are much more to be confided in than the former.

And first, The Application of ♄ to the following Star in the Left Wing of ♍ *Anno Ante Christum* 229. *March* the second in the beginning of the night, compared with that of ☽ to ♄ *Anno Christi* 138. *Dec.* 22. just 8^{h}. *P.M.* at *Alexandria*, doth exactly agree with my Præcession of the *Æquinox.*

Secondly, The ☌ of ☽ with *Palilicium* Observed *Anno Christi* 509 *March* 11th after the going down of twilight; when the true Motion of the Moon was (by the Tables of *Ptolomy*, for it cannot be understood any otherwise) in ♉. 16°. 36$'$. I have considered as followeth.

Anno Christi, 509. *March* 11th. *Nabonassari* 1256. *Epiphi* 28^{d}. 5^{h}. 31$'$. *T. M.* at *Alexandria*; by the Tables of *Ptolomy*, the Middle Motions of the Moon are, from the Æquinox 44°. 21$'$. 20$''$. from her Apog. 326°. 5$'$. 34$''$. from the Sun 56°. 11$'$. 47$''$. and hence according to the Theory and limited Numbers of *Ptolomy* in *Lib.* 5. the absolute Æquation of ☽ is by exact Trigonometrical Calculation 2°. 8$'$. 41$''$. to be added; which gives the true Motion of ☽ (as above) in ♉. 16°. 30$'$.

Also the Æquation of Time (according to *Ptol. in fine Lib.* 3.) is 5$'$ to be added to the Equal, so that the Apparent Time at *Alexandria* is 5^{h}. 36$'$.

But at the Place of the Observation, it was about an hour and a half after Sun-setting; and therefore supposing the time 7^{h}. 20$'$. this was in Longitude from *Alexandria*, 1^{h}. 44$'$. and from *Athens* 2^{h}. 20$'$.

The Apparent Time at *London* is 3^{h}. 25$''$. The Equal Time by my *Astronomia Carolina* 3^{h}. 31$'$. The true place of the Sun in ♓ 22°. 52$'$. 25$''$. and the true place of the Moon in ♉ 20°. 29$''$. 17$'''$, with Latitude South 4°. 58$'$. 41$''$. But in the Meridian where the Observation was made, and Latitude of 40°. North, the Parallax of the Moon in Altitude was 42$'$. 23$''$. in

Longitude

Longitude 38′. 33″. in Latitude 17′. 58″ and therefore her visible Place in ♉. 19°. 51′. with Lat. South 5°. 17′.

The true place of *Palilicium* was then by my Tables in ♉. 19°. 38′. with correct Latitude South 5°. 30′.

But by the account of *Vincint Wing*, in his pretended *Examen*, the Star was at that time in ♉. 18°. 54′.

The *Greek* Text may be seen in *Astronomia Philolaica* Lib. 3. Pag. 172. where *Bullialdus* thus Translates it.

Anno 225 Diocletiani Phamenoth 15 in 16 Vidi Lunam sequentem claram Hyadum post accensas lucernas (id est prima face post recessum crepusculi) *digiti unius ad summum semisse. Videbatur autem occultasse ipsam. Stella quippe apposita erat parti, per quam bisecabatur limbus Lunæ illuminatus. Erat tunc Luna juxta veros motus in Tauri grad.* 16°. 30′.

But because the true motion of ☽ as it is there set down (ις ς′ μοῖραν τοῦ ταύρου) may as well be taken for ♉. 16°. 10′. as 16°. 30′. If we take it to be 16°. 10′; Then by the Observators account was the Longitude of the Place of Observation about 2ʰ. 24′. to the East from *Alexandria*; which (in regard that the differences of Meridians in all ancient Catalogues are for the most part too great) might probably be no more than 2 houres; and hence the Correct Motion of the Moon by *Ptolomy's* Tables will be in ♉. 16°. 22′. and the Apparent Time at *Alexandria* 5ʰ. 20′.

3. The Observation also of the Appulse of ☽ to ♄ *Anno Christi* 503. *Feb.* 21. may very rationally be determined in the same Meridian with this of ☽ to *Palilicium*, *viz.* about 2 hours to the East from *Alexandria*; which is a farther good Argument that the Annual *Præcession* of the *Æquinox* exceeds not 48″, and likewise that the *Aphelion* of ♄ is really fixed; But of the *Aphelions* more in my Examination of *Wing's* fourth *Section*.

4. *Anno Christi* 138 *Decemb.* 15ᵈ. 14ʰ. 31′, was the Equal Time at *London*, when *Ptolomy* at *Alexandria* Observed ♀ between and in a right line with the Northern bright Star in the front of ♏ and the visible Center of the Moon (*Ptol. Lib.* 10. *Cap.* 4.) To which my Tables do præcisely agree; and by this the said *Præcession* is proved just 48″.

5. *Anno Christi* 140. *July* 29. 14ʰ. reduced unto *London*; ♀ was observed about half the Diameter of the Moon to the East from the Left knee of the following Twin. *Ptol.* But by my Tables ♀ was then 1°. 4′. to the East from the Star: So that by this Observation of *Ptolomy* compared with those of *Tycho*, the Annual *Præcession* of the *Æquinox* in less then 47″.

6. In the 21ᵗʰ year of *Dionysius*, that is, in the year before *Christ* 265, the Observations on the 22 & 26 days of the Month *Scorpio*, of the Motion of ☿ by the bright Stars of the front of ♏, duely considered according to Longitude

gitude and Latitude, with the usual Contraction of the Eye, do excellently demonstrate the Verity of my Tables, by which the Annual Retrocession of the Æquinoctial Points is just 48″.

Also, *Anno* 265 *ante principium Antonini*, that is *Ante Christum* 129. the Declination of *Capella* was observed by *Hipparchus* 40°. 24′. North, but by Modern Observation the Correct Latitude of the Star is 22°. 52′. North.

And in *principio Antonini*, *Anno Christi* 137. the Declination of *Aldebaran* by *Ptolomy* was 11°. 0′. North, but his true Latitude is 5°. 30′. South.

Hence, with our Corrected Obliquity of the Ecliptick 23°. 30′, the Place of *Capella* was by the Observation of *Hipparchus* in ♉. 23°. 8′. And by my Tables the Star was then in ♉ 23°. 12′. but by *V. Wing*, in ♉. 22°. 3′.

The place of *Aldebaran* by the Observation of *Ptolomy* in ♉. 14°. 30′. by my Tables in ♉. 14°. 40′. but according to *V. W.* in ♉. 13°. 42′.

Thus it appears that some of those Antient Observations of the Fixt-Stars Declinations, mentioned by *Ptolomy Lib. 7. Cap.* 3. are sufficiently consentaneous unto my limitation in *Astronomia Carolina*: But in most of the Applications of ☽ to Fixt-Stars, and in several other respects, it is too manifest that *Ptolomy* hath adhered rather to his own *Hypotheſis*, then the reality of *Observation*.

And touching the Observations of intermediate Ages from *Ptolomy* unto our times, though in the 24th *page* of my *Appendix*, and in *Wings* own Conscience (if he have any) his Accusations are already proved false, I shall here (for the Courteous Readers satisfaction) compare as well *Wing's* Determination of the Fixt-Stars places as mine, with the *Verification* of *Alfuphius*, *Anno Christi* 936 Compleat, and but 54 years after *Albategnius* his Industrious Observations of the true place of the *Sun* in both Æquinoxes.

Nomina

Nomina Stellarum.	Long. Vtriſ. Ex.	Aſt. Car	Diffr.	Long. Wing.	Differ.
	° '	° '	'	° '	'
Prima Cornu ♈	♈. 19. 22	♈. 18. 45	—37	♈. 18. 18	—64
Lucida Pleiadum.	♉. 16. 22	♉. 15. 32	—50	♉. 15. 5	—77
Aldebaran.	♉. 25. 22	♉. 25. 20	— 2	♉. 24. 54	—28
Rigel.	♊. 2. 32	♊. 2. 25	— 7	♊. 1. 58	—34
Capella.	♊. 7. 42	♊. 7. 24	—18	♊. 6. 57	—45
Lucida pedis ♊	♊. 20. 52	♊. 20. 52	— 0	♊. 20. 25	—27
Lucida altera pedis ♊	♊. 22. 52	♊. 22. 22	—30	♊. 21. 55	—57
Sirius.	♋. 0. 22	♊. 29. 43	—39	♊. 29. 17	—65
Caſtor.	♋. 6. 2	♋. 5. 49	—13	♋. 5. 22	—40
Pollux.	♋. 9. 22	♋. 8. 51	—31	♋. 8. 24	—58
Procyon.	♋. 11. 52	♋. 11. 26	—26	♋. 11. 0	—52
Cor ♌	♌. 15. 12	♌. 15. 25	+13	♌. 14. 58	—14
Cauda ♌	♍. 7. 12	♍. 7. 11	— 1	♍. 6. 44	—28
Azimech.	♎. 9. 22	♎. 9. 24	+ 2	♎. 8. 57	—25
Arctirus.	♎. 9. 42	♎. 9. 47	+ 5	♎. 9. 20	—22
Lanx Auſtralis.	♏. 0. 42	♏. 0. 39	— 3	♏. 0. 12	—30
Lanx Borealis.	♏. 4. 52	♏. 4. 56	+ 4	♏. 4. 29	—23
Lucida frontis ♏	♏. 19. 2	♏. 18. 44	—18	♏. 18. 17	—45
Antares. Cor ♏	♏. 25. 22	♏. 25. 21	— 1	♏. 24. 54	—28
Lyra.	♑. 0. 2	♑. 0. 51	+49	♑. 0. 24	+22
Cor Aquilæ.	♑. 16. 32	♑. 17. 17	+45	♑. 16. 50	+18
Extrema Ala Pegaſi.	♓. 24. 52	♓. 24. 46	— 6	♓. 24. 19	—33

But now if any man will rather accept of the generality of other Obſervations related by *Ptolomy*, though there be leſs probability of truth in them then in thoſe by which I have limited my Præceſſion of the Æquinox; he is freely left to his own choice until ſucceeding times ſhall produce a more clear diſcovery: However, though I value not the gratifications of *Vincent Wing* or his *Ingenious Mathematician* in the *Margin*, I ſee no reaſon why I ſhould be ungratefully rail'd at or calumniated for my pains taken in this or any other particular of my late publiſhed *Aſtronomy*.

In *pag.* 26 of that *Examen*, *Wing* learnedly ſets down *Azophus* and *Ebnezophus* for two diſtinct Perſons, *viz.* *Azophus* to obſerve the place of

Cor

Cur & Anno Christi 937. and *Ebennesophim* Anno 1364. though *Bullialdus* in Ast. *Philolaica* Pag. 225, saith, *De nomine Ebennesophim hoc notandum est, ab aliis Azophi appellari*: But that he may not hereafter mistake *Alsuphim* for some third Person, his best way will be to enquire farther of it at *Oxford*.

The ridiculous and idle conclusions of *Wing* in his following 27 and 28 *pages*, are also sufficient refutation to themselves: And here (though I think it no safe course to steer by anothers Compass) the Reader may be pleased to take notice, that the *Period* of the *Praecession* of the *Æquinox*, or one whole *Revolution* of the Fixt-Stars, is according to the antient account of *Hipparthus* and *Ptolomy* in 36000 years, but by the limitation of *Tycho* and *Kepler* in 25412 years, by *Longomontanus* in 26040 years, by *Lansberg* in 28000 years, by *Bullialdus* in 25442 years, by *Riccioli* in 25920 years, and lastly by my determination in *Astronomia Carolina* in 27000 years.

An Examination of Wing's *fourth* Section.

IN this Section (beginning in *pag.* 28.) *Wing* saith it is shewed, that if the Aphelions and Nodes of the Planets are alway fixed, its then altogether impossible for Astronomers to determine exactly the true places of the Planets in all Ages.

I shall not here trouble the Reader or my self with all *Wings* idle chat, Of the Observations of all Astronomers, Of Reasons not worth a Fig, Of the Eighth Orbe, and of Rest in the Superficies or Sphære of the Fixt-Stars: Yet I must take some notice of that mistake of *Kepler* in *Epit. Astron.* which *Wing* in his 29th *page* (without any acknowledgment) borroweth, *viz.* that the manifest *Motion* of the *Apogæon* and *Nodes* of the *Moon*, is an argument of the Translation of the *Aphelions* and *Nodes* of the *Primary Planets*.

And though the ingenious *Kepler* were he now alive, would undoubtedly acknowledge his error in this particular; I would know first, If the various Inequalities of the ☽ may be rationally imposed on the *Primary Planets*.

2. If there be any thing of Probability or likelihood in it, that the one *Focus* of the Ellipsis of each *Primary Planet* being *Fixed*, the other should be *Movable*.

3. The *Earth* being one of the *Primary Planets*, and the *Poles* of her *Orbite Fixed*, what should cause a *Motion* of the *Poles* of the *Orbites* of all or any of

the other *Primary Planets*, or much leſs a *Revolution* of them about the *Poles* of her *Orbis*?

But I conclude, That the Motion of the *Apogeon* and *Nodes* of our *Secondary Planet* the *Moon*, is no more an argument or reaſon for the Tranſlation either of the *Aphelions* or *Nodes* of the *Primary Planets*, than her ſecond Inequality compoſed of *Evection* and *Reflection* is for impoſing the like inequalities upon them. And as the ſecondary Inequalities of ♄, ♃, ♂ ♀ and ☿, are really no other than the *Parallax* of the *Earths Orbe*, ſo neither is the Progreſſion of their *Aphelions* and *Nodes* any other then the *Praceſſion* of her *Æquinoctial*.

The reſt of *Wings* 29th as alſo his 30th *page* is a farther preface ſutable (as well for truth as ſenſe) to that ſtuffe which follows: And then in *page* 31. he produceth an antient Obſervation out of *Ptolomy Lib.* 11. *Cap.* 7. where who that pleaſeth may ſee the Original Text, *viz.*

Anno Nabon 519. *Tybi* the 14th, in the Beginning of the night ♄ was 2 digits under the following Star in the left wing of *Virgo*.

And to this my *Tables* and Calculation in *Aſtronomia Carolina* do ſufficiently agree; though *Ptolomy* and his followers (not duely conſidering in what part of Heaven the Obſervation was made) have ſuppoſed *Saturn* and the Star Conjunct in the ſame Longitude, as if they had been then in the 9th degree of the Ecliptick: And here, becauſe I run not into the ſame miſtake with the reſt as *Wing* hath done, he chargeth my Tables with the Error of his own.

Next, in *pag.* 32. touching the Obſervation of ♃ his hiding of the South *Aſellus*, *anno ante Chriſtum* 241. *Wings* words are theſe, *But our Antagoniſt (being willing to ſave his Credit and Cheat the World with his doings) hath not produced this famous Obſervation, nor ſo much as mentioned it in any of his Writings, (which doubtleſs was becauſe he ſaw it impoſſible to make his Tables agree thereto.) therefore to undeceive his Readers, I ſhall here give you the Calculation thereof from his own Tables.*

Thus you may ſee, that whoever diſputes with ſuch an *Antagoniſt* as *Vincent Wing* and teacheth him alſo, hath a good office of it: but if I am a *Cheat* for not producing of this uncertain Obſervation whereof I had no need, what is he that in his *Harmonicon Cœleſte*, his *Aſtronomia Inſtaurata*, his *Ephemerides* for 20 years, and in all his other Writings, hath not only omitted the comparing of his Tables with this, but with many other more Certain and Neceſſary Ancient Obſervations?

And though in my *Aſtronomia Carolina* I have ſufficiently demonſtrated as well the *Middle motions* as the Æquations of all the *Planets*, yet here, that I may give a better & truer account of this Obſervation then that of *Wing*

in his 32 and 33 *page*, I say that by the Text of *Ptolomy* in *Lib.* 11. *Cap* 3 *In the* 45th *year of Dionysius, the* 10th *day of the Moneth Virgo in the Morning* ♃ *hid or covered the South Asellus* : And this *Wing* in the end of *pag.* 33. (though not rightly understanding it) acknowledgeth.

But of the account of *Dionysius*; That it was constituted about 400 years before the time of *Ptolomy*, and depended on the *True Motion* and entrance of the *Sun* into the 12 Signes; and that *Ptolomy* hath made a wrong construction of it, according to the *Middle Motion* of the *Sun* by his own Tables, the Courteous Reader may be satisfied in the 105th *page* of *Cunitia, De Usu Tabularum.*

So, in this 45th year of *Dionysius*, and 507th of *Nabonassar*; though by the Tables of *Ptolomy*, the *Middle Motion* of the *Sun* was in the 10th degree of ♍ on the 18th day of *Epiphi*; yet by all Tables that are grounded on Observations of any certainty, the 10th day after the True enterance of the *Sun* into ♍ was then the 20th of *Epiphi*; that is, *Anno ante Christum* 241 *September* the 6th, and the time of the Morning æquated and reduced unto *London* is 2h. 30′.

And now if *Vincent Wing* will be pleased to calculate once again, he shall find the true place of the *Sun* and *Jupiter* to be as followeth.

The Places of ☉ *and* ♃ *Computed by my Tables of* Astronomia Carolina, Anno Ante Christum 241. *September* 5d. 14h. 30′.

		°	°	′	″	°	°	′	″	
Anno Chri.	1	6	23	19	56	0	6	16	0	
Sub.	300	11	28	15	15	0	4	0	0	
Ante Chri.	300	6	25	4	41	0	2	16	0	
Adde.	40	11	29	46	2			32	0	
	19	11	29	9	1			15	12	
September.		7	29	30	12				32	
Biss. dies.	5		5	54	49				1	
Hor.	14			34	30					
Min.	30			1	14					
Anom. Med.	☉	3	0	0	29	0	3	3	45	*Prac. Æq.*
Long. ☉ à 1 ✱ ♈		5	6	21	25	*Long. dist.*		☉	à ☉	
Ab Æquin. in		♍	9	25	10		5	000	129.	

		° ′ ″
Anno Chri.	1	0. 13. 54. 30
Sub.	300	3. 14. 52. 30
Ante Chri.	300	8. 29. 2. 0
Adde.	40	4. 13. 59. 0
	19	7. 6. 34. 47
September.		20. 11. 29
Biss. dies.	5	29. 55
Hor.	14	2. 54
Min.	30	6
Anom. Med. ♃		9. 10. 20. 11
Long. Heliac.		2. 25. 31. 57
Long. ☉		5. 6. 21. 25
Commutatio.		2. 10. 49. 28
Elong. Sub.		2. 1. 13. 28
Long. ♃ *Geoc.*		3. 5. 7. 57

Long. distant. { ♃ à ☉-5-720775 / ⊖ à ☉-5-000129

	° ′ ″	
Tan.	79. 13. 39	— 10. 720646
R. Tan.	34. 13. 39.	— 9. 832701
Tan.	35. 24. 44.	— 9. 851860
Tan.	25. 48. 44.	— 9. 684561
Sum.	61. 13. 28.	*Elongatio* ♃
	° ′ ″	
Sin.	70. 49. 28.	— 9. 97521
Sin.	61. 13. 28.	— 9. 94276
Tan.	0. 24. 6	— 7. 84575
		17. 78851
Tan.	0. 22. 22.	— 7. 81330
	Lat. ♃ *Bor.*	

The Sidereal Longitude of the *South Asellus* is 3ˢ. 5°. 31′. and his Correct Latitude North 5′. 12″. Therefore the difference of Longitude was 23′. 3″. and of Latitude 17′. 10″. and hence the distance of the Centers of ♃ and the Star was 28′. 44″. which had the Star been then seen, would by reason of the contraction of the eye have seemed not above 4 digits: But that the light of ♃ or ♀, and sometimes also of ♂, may at a greater distance then 30′. Eclipse or hide Stars of the 4th Magnitude from the bare eyes of most Observators I have often experimented; and of this (after I have farther examined this Section) I shall anon produce an Example.

Hence (though *Wing* in *Pag.* 24 most absurdly talks of a distance of 7 or 8′.) the Judicious may easily perceive upon what fallacious and uncertain grounds most of our Modern *Astronomers* have translated the *Aphelion* of *Jupiter*.

And that (far more Certain) Observation of the ☌ of ♃ with *Cor* ♌. *Anno Christi* 508. *Sept.* 26ᵈ. 14ʰ. by which I have limited the Middle-Motion of ♃, Compared with that of *Bullialdus*, *Anno* 1623. *Octob.* 2ᵈ. 17ʰ. the Latitude of ♃ being by estimation in both Observations made by the bare eye just 3 digits more northerly then the Star, doth excellently demonstrate the Immobility of his *Nodes*. But of these two last mentioned Observations

vations published by *Bullialdus* in his *Ast. Philolaica*, you may see my Calculation in *pag.* 106 and 112. *Astronomia Carolina.*

The account also which in my 108th *page* I have given of the application of ♀ to the former Star of the 4 in the Left Wing of ♍ (this being as well as the *South Asellus* a Star of the 4th Magnitude) is altogether sufficient. And *Bullialdus* in *Ast. Philolaica pag.* 350. relates the Greek Text of *Ptol.* in *Lib.* 10. *Cap.* 4. with this Interpretation, *Non significat Venerem obscuravisse stellam illam, sed adsecutam fuisse*; which *Wing* in in his 35 *page* leaves out, and will have it, that *Venus* was *contained upon* the Star, onely telling us that *Bullialdus Thinks* it was not a Central Conjunction.

But then at last, in *pag.* 35 and 36. for a farther confirmation of his *Antagonists* Errors, *Wing* very opportunely, out of *Ptol. Lib.* 10. *Cap.* 9. discovers the *Falsity* of his own *Borrowed Fundamentals* of the *Translation* of *Aphelions*, producing the Application of *Mars* to the *Northern fore-head* of the *Scorpion*, Observed in the 13th year of *Dionysius*, the 25th day of *Capricorn* in the morning; which *Bull.* in *Ast. Phil. pag.* 326. rendreth thus, *Ægonis* 25. *stella ♂ manè apparuit apposita seu adjuncta Boreali fronti Scorpii.*

This was indeed in the year before Christ 272. *January* 17^{d}. 15^{h}. 30$'$. in respect of our Meridian of *London*. To which time, by my Tables of *Astronomia Carolina*, I thus Calculate the true places of the *Sun* and *Mars*.

		s	°	′	″	s	°	′	″	
Anno Chri.	1	6	23	19	56	0	6	16	0	
Sub.	300	11	28	15	15	0	4	0	0	
Ante Chri.	300	6	25	4	41	0	2	16	0	
Adde.	20	11	29	53	1			16	0	
	8	11	29	57	12			6	24	
Januar. d.	17		16	45	19				2	
Hor.	15			36	58					
Min.	30			1	14					
Anom. Med.	⊖	7	12	18	25	0	2	38	26	*Prac. Æq.*
Long. ☉ *à* 1 ✱ ♈		9	21	59	52	*Long. dist.* ⊖ *à* ☉				
Ab Æquin. in	♑		24	38	18	4.994463.				

	°	′	″
Anno Chri.	10.	2.	3. 36
Sub. 300	6.	1.	6. 0
Ante Chri. 300	3.	0.	57. 36
Adde. 207	7.	18.	4. 24
83	3.	1.	13. 46
Jaun. die 17		8.	54. 31
Hor. 15			19. 39
Min. 30			39
Anom. Med. ♂	1.	29.	30. 35
Long. Helioc.	5.	22.	6. 29
Long. ☉	9.	21.	59. 52
Commutatio.	3.	29.	53. 23
Elong. Sub.	2.	22.	18. 11
Long. ♂ *Geoc.*	6.	29.	41. 41

Long. distant. { ♂ à ☉ 0-5-205232 ; ☉ à ☉ 0-4-994463

	°	′	″	
Tan.	58.	23.	15 —	10. 210769
R. Tan.	13.	23.	15. —	9. 376583
Tan.	59.	56.	41. —	10. 237594
Tan.	22.	21.	30. —	9. 614177
Sun.	82.	18.	11.	*Elongatio* ♂
Sin.	60.	6.	37. —	9. 93801
Sin.	82.	18.	11. —	9. 99607
Tan.	0.	50.	58. —	8. 17104
	°	′	″	18. 16711
Tan.	0.	58.	15. —	8. 23910
	Lat. ♂ *Bor.*			

The Sidereal Longitude of the *Northern* bright Star of the *Fore-head* of the *Scorpion* is 6°. 29′. 59″. and his Correct Latitude North 1°. 4′. Therefore the difference of Longitude was 17′. 19″. of Latitude. 5′ 45″. and the distance of the Centers of ♂ and the Star 18′. 15″. which (considering the dilatation of sight with the contraction of the Eye) agrees exactly enough with the Observation.

And that this bright Star was the very same unto which ♂ was then applyed or adjoyned; not onely the testimony of *Ptolomy*, but several other Observations of his Predecessors, and also the Latitude of *Mars* at the time of this Observation (as well by the Tables of *Kepler* and *Bullialdus*, as by my Calculation) do clearly demonstrate.

Yet *Bullialdus* (in imitation of *Kepler*) accepts of *Borealissima frontis*, a smal Star of the 4th Magnitude, and never mentioned in any of the Observations of the Ancients, which according to *Tycho* is in Consequence from the said bright Star 1°. 27′. 30″. and in Latitude North 1°. 42′. and his onely reason for so doing he expresseth in his *Astronomia Philolaica, pag.* 328. in these words, *Impossible est enim adsumpta Lucida, conciliare* ♂ ♃ *cum Corde* ♌ *à nobis allatam & celebratam anno Christi* 508. *Septemb.* 27. *manè, hasque binas* ♃ *&* ♂ *conjunctiones.*

But here the Learned *Bullialdus* is (as well as *Kepler*) mistaken; For without any injury to that ancient Observation of ♂ with the *Bright Star*

of

of the *forehead* of ♏, the *Aphelions* being *Fixed*, the ☌ of ♄ with *Cor* ♌. Observed *Anno Christi* 508. *Sept.* 27. and those two Conjunctions of ♃ and ☌, the one Observed *Anno* 498, *May* the first, and the other *Anno* 509. *June* the 13th. And besides these, the ☍ of ♃ and ☌ *Anno* 1170. *Sept.* 13. are all reconciled in *pag.* 106 and 107 of my *Astronomia Carolina*.

And now the Example that I promised touching the light of some of the *Planets*, that they may at some times Eclipse small Fixt Stars at a distance of more then 30′, is this.

Anno 1655. *October* the 17th about 9h *P. M.* at *London*, the Air being clear, my self and several young Men with me on *West-Tower-Hill* endeavoured to discover the first of the two bright Stars of the tail of ♈, but could none of us with our bare eyes then see him, though there was no other known impediment but only the light of *Mars*.

The next following night, *October* the 18th. 9h. *P. M.* by help of a Perspective, I saw *Mars* in or very near the same Longitude with the said Star, but in less South Latitude about 6′.

Again the next night after that, *October* the 19th. 9h. *P. M.* the Air being very clear, neither my self, nor another Gentleman whose testimony I believe I can yet produce, could without the Perspective discover the same Star.

But in all these 3 nights, at the times before mentioned, without the help of any Glass, we very plainly saw the second of the Tail of ♈, and store of other far smaller Stars at a greater distance from *Mars* round about in the Hemisphere.

The Diurnal Motion of ☌ between these 2 last Observations, was 34′. 40″.

Nevertheless, that Stars of the 4th Magnitude have appeared to the bare eye within 20′ of ☌ I will not deny; but within 30′ of ☿ or ♃, I conclude from many other experiments, that to most Mens eyes it is hardly possible.

Thus is the truth of the Fixation of the *Aphelions* and *Nodes* of the Primary Planets Illustrated, and the Errors of *Vincent Wing* (as well by the same Observations which himself hath produced, as by many other) made apparent; his language compared with his pretences in the latter end of this Section, yet farther condemning him.

But if *Wing* or any other hereafter will yet absurdly contend, and fly to some contradictory relations of *Ptolomy* for a defence of their Errors, this Answer is provided; That when all the Observations that are already extant, or those which for the future may be made or had, are faithfully compared, as well the more certain as the more in number will still remain on my side: And who then that is not *inops mentis* will endeavour to impose Fictitious

fictions and unnatural Motions on the Heavens, or perplex himself and others with their groundless Calculation?

An Examination of Wing's *fifth* Section.

WHerein saith Wing, *the Cavil of Mr.* Street *in his Appendix against our Demonstration of the transit of* ☿ *sub sole is removed.*

And so with the same Face as in the rest, he goes on with this Section; first telling his Reader in *Pag.* 37. *That his Antagonist would teach him* (he should say, *hath taught him*) *how to calculate the Angle of the visible way of Mercury with the Ecliptick, when he passeth between the Earth and the Sun*: But then in the same 37th, and also in his 38th and 39th *pages* he most absurdly addeth, *That the Method is no other in effect then what he hath formerly made use of*, with these words in *Pag.* 38. *But had our Demonstration been false, as our Antagonist seems to infer, which will in no wise be granted him; yet in a matter of that nature, where little or no Errour ariseth thereby, it had been more commendation to keep silence*, &c. And yet in *pag.* 39. he computeth the said Angle (accordingly as I taught him in my *Appendix*) to be *Anno* 1661 *April* the 23d, 10 degrees, 17′, which in his *Ephemerides* for 13 yeares (before that for 1661) he had made by his own *false demonstration* 3°. 40′. 16″ and thence erroneously concluded the time of the Beginning, Middle and End of that *transit* of ☿ *sub Sole*: And if this be the same in effect, let any Man that doth but know how to calculate make trial.

But because he also seeks to excuse his Gross Ignorance with many other abusive expressions, and would perswade such as understand *Astronomy* no better then himself, *that the matter aimed at was onely the neerest appropinquation of the Centers of* ☉ *and* ☿, *wherein the Errour being but* 2″ *and he using it for Ease of Calculation, it would have been more for my credit to have spared my pains in that particular*; I shall therefore here for an *Example*, first Calculate the passage of ☿ between the *Earth* and *Sun* which will be *Anno* 1674. *April* 26 and 27. according to *Truth* and the *Method* by me published in my said *Appendix*; And secondly, taking the *Angle* of the visible way of ☿ with the Ecliptick according to that method which *Wing* for several years hath used, & still endeavoureth to defend, shal shew the Difference.

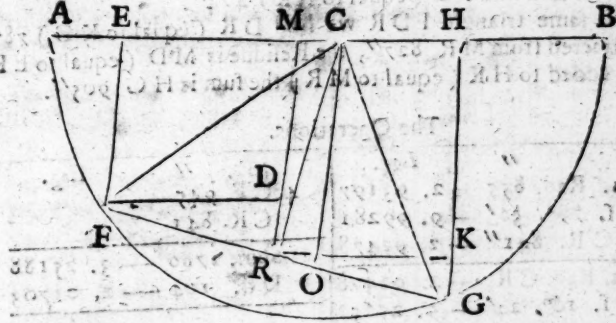
In the ☌ of ☉ and ☿ which by my Tables of *Astronomia Carolina* happeneth *Anno* 1674. *April* the 26th day, 13h. 17′. 33″. *T. M.* but 13h. 33′. 30″. *T. A.* in respect of the Meridian of *London*.

The

	° ° ′ ″		° ° ′ ″
The Mean Anomaly of ☽ is	10. 8.13.36	Of ☿	10.22.24.45
Sidereal Longitude of ☉	0.18. 5.54	☿ Helioc.	6.18. 5.54
Præceſſion of the Æquinox	0.28.34.40	Incli. ☿ Auſt.	0.17.24
☉ and ☿ from the Æquinox in ♉	16.40.34	Latit. ☿ Auſt.	0.14.15

To 6 houres before the true *Conjunction*.

	° ° ′ ″		° ° ′ ″
The Mean Anomaly of ☉ is	10. 7.58.49	Of ☿	10.21.23.22
Sidereal Longitude of ☉	0.17.51.26	☿ Helioc.	6.17.22.53
Commutation	5.29.31.27	Incli. ☿ Auſt.	0.12.12
Elongation of ☿, Adde	0.23.20	Latit. ☿ Auſt.	0. 9.58
The Difference of Latitude	257″. Log. + Rad.		12.40993
The Elongation	1400. Log. Sub.		3.14613
Angle of the viſible way of ☿ with the Ecliptick	10°.24′. Log. Tan.		9.26380



Then let C be the Center of the Sun, A FG a part of his viſible periphery, CF equal to C G his Semidiameter, which by my Tables is to the time before mentioned 15′. 45″. AB a part of the Ecliptick, FD and RK parallels to it. F R G the viſible way of Mercury in reſpect of the Earths Center, C O his Latitude at the true ☌, which was before found 14′. 15″. C R the neareſt diſtance of the Centers of ☉ and ☿, M R the *Latitude* of

Mercury

☿ when he is placed in R, E F his Latitude at the Central Ingress, and H G his Latitude at the Central Egress.

Therefore F R is equal to R G, F D to R K, and D R to K G:

Likewise D F R, K R G, R C O, and M R G are equal to the Ang'e of the visible way of *Mercury* with the Ecliptick, which we found by our last operation 10°. 24′.

M C is the Motion of ☿ from ☉ in Longitude in the interval between the true ☌ and the Middle of this Mercurial Eclipse. E M equal to M H, F D or R K, the Motion of half Duration. And lastly, A F and G B are Arches of the Suns visible periphery intercepted between *Mercury* and the Ecliptick in his Ingress and Egress.

First, In the Triangle C R O, by the right ang'e at R, C O 855″, and C O R 79°. 36′, we find C R 841″.

2. The triangle R M C, by the right angle at M, C R 841″, and M R C 10°. 24′ we find M C, 152″.

3. In the same triangle R M C, we find M R, 827″.

4. In the triangle F R C, by the right angle at R, C F 945″, and C R 841″, we find F R (equal to R G) 431″.

5. In the triangle F D R, by the right angle at D, F R 431″, and F R D 79°. 36′, we find F D (equal to R K) 424″.

6. In the same triangle F D R we find D R (equal to K G) 78″, which Subtracted from M R 827″, the Residue is M D (equal to E F) 749″, and added to H K (equal to M R) the sum is H G 905″.

The Operations.

″	Log.	″	Log.
1. Rad. 855	— 2. 93197	4. C F. 945	
s. 79°. 36′	— 9. 99281	C R. 841	
C R. 841″	— 2. 92478	Sum. 1786	— 3. 25188
2. Rad. C R.	— 2. 92478	Diff. 104	— 2. 01703
s. 10°. 24′	— 9. 25652		5. 26891
M C. 152″	— 2. 18130	F R. 431″	— 2. 63445
3. Rad. C R	— 2. 92478	5. Rad. F R.	— 2. 63445
s. 79°. 36′	— 9. 99281	s. 79°. 36′	— 9. 99281
M R. 827″	— 2. 91759	F D. 424″	— 2. 62726

Lg.

6. Rad. F R — 2. 63445.
s. 10°. 24′ — 9. 25652
D R. 78″ — 1. 89097.

7. For

7. For the Interval in time between the true ☌ and middle of the Eclipse, I say, As the above found Elongation 1400″, is to 6 houres, or (which is all one) As the 6th part of the Elongation, that is 233. ⅓″. to one hour or 3600″, so is M C. 152″ *fere*, to 2342″ or 39′. 2″, the Interval, which substracted from 13ʰ. 33′. 36″. the time of the true ☌, there rests 12ʰ. 54′. 34″. The middle of the Eclipse.

8. For the time of half-duration, I say, as 233 ⅓″. to one hour or 3600″, So is FD or RK424″ *fere*, to 6540″ or 1ʰ. 49′. 0″. which substracted from and added to 12ʰ. 54′. 34″. the time of the Middle, the residue will be 11ʰ. 5′. 34″. the Central Ingress, and the sum 14ʰ. 43′. 34″. the Central Egress.

(7.)	″	*Log.*
	233. ⅓.	2. 36798
	3600.	3. 55630
	M C	2. 18130
		5. 73760
	2342″.	3. 36962

(8.)	″	*Log.*
	233. ⅓.	2. 36798
	3600.	3. 55630
	F D	2. 62726
		6. 18356
	6540″	3. 81558

Therefore, in this ☌ of ☉ and ☿ *Anno* 1674. *April* the 26th.

The *Apparent Time* of	ʰ	′	″	Lat. ☿ South
The true ☌ is	13.	33.	36	14′. 15″
The Interval Substract		39.	2	
The Middle of the Eclipse	12.	54.	34	13. 43. Cent. Dist. 14′. 1″
The half-Duration	1.	49.	0	
The Central Ingress	11.	5.	34	12. 29
The Central Egress	14.	43.	34	15. 5

The Arches A F and G B are thus found.

	″	*Log.*
R. + E F.	749	12. 87448
— C F.	945	2. 97543
Sin. A F.	52°. 26′	9. 89905

	″	*Log.*
R. + H G	905	12. 95665
— C G	945	2. 97543
Sin. G B.	73°. 16′	9. 98122

Moreover, in such parts as the Mean Distance of the Earth from the Sun is 10000 (by the Logarithms of ☊ and ☿ at the true ☌) we find the Distance of ☊ from ☉ 10109, and of ☿ 4551. the

difference is 5558 the distance of ☿ from ☉, but the Semidiameter of ☿ in his mean distance from ☉ is 5″. Therefore as 5558, to 10000, So is 5″ to 9″, the Apparent Semidiameter of ☿ at this time.

So much touching the Calculation of the Transit of ☿ between the Earth and Sun, by a Method most ease and sufficiently exact.

We shall now shew the *Errors* that must necessarily follow by mistaking the *Angle* of the *Visible* way of ☿ with the Ecliptick according to that method of *Vincent Wing*, by him published before his *Ephemeris* for 1661, again before that for 1664, and the third time in his Almanack for 1664. which is thus.

At the Apparent time of the true ☌ of ☉ and ☿ Anno 1674.
April 26d. 13h. 33′. 36″.

	s.	o.	′	″		
The Sidereal Long. of ☉ is	0.	18.	5.	54		
The Node of ☿ Substract	0.	15.	42.	0		
☉ from the Node		2.	23.	54.	Sin.	8.62166
The Lat. of ☿ South		0.	14.	15.	Tan.†R.	17.61754
		5.	39.	25.	Tan.	8.99588

Which 5°.39′.25″. is according to *V. W.* the Angle of the Visible way of *Mercury* with the Ecliptick at this time: The Error is 4 degrees and ½ And hence,

	″	Error	″		″	Error	″
1. CR will be	851	+	10	4. FR	411	—	20
2. MC	84	—	68	5. FD	409	—	15
3. MR	847	+	20	6. DR	41	—	37

7. The Interval in time between the true ☌ and Middle of the Eclipse 21′. 40″. Error — 17′. 22″.

8. The Time of Half-Duration 1h. 45′. 8″. Error — 3′. 52″.

Therefore,

	h	′	″		Error
The Apparent Time of true ☌ being	13.	33.	36		
The Interval Substract.		21.	40	—	17′. 22″.
The Middle of the Eclipse will be	13.	11.	56	+	17. 22 .
The Half-Duration Sub. and Add.		1.	45.	8	— 3. 52
The Central Ingress	11.	26.	48	+	21. 14
The Central Egress	14.	57.	4	+	13. 30

The Arch AF. 58°.32′. Error†6°.6′. And the Arch GB. 69°.49′ Er. 3°.27′.

And

And though (in proportion to the leſſer Latitude of ☿) in the ☌ of ☉ and ☿ *Anno* 1661. *April* the 23th, the Error in the Time of the Beginning, Middle and end of that Eclipſe will be there leſs, yet in the Latitude of ☿ at the Beginning and End it will be much greater, and alſo in the Arches of the Suns viſible periphery intercepted between ☿ and the Ecliptick moſt notoriouſly preceptible.

Thus have I ſhewn the Vanity and Falſity of *Vincent Wing*, as well touching the *Tranſit* of *Mercury ſub Sole*, as throughout all the reſt of his Lewd *Examen*; whereby it plainly appears, that *Ex quolibet Ligno non fit Mercurius*. But that nothing of conſequence may be left him for a colour to thoſe falſe accuſations, in his 39th and 40th *pages*, I preſent the Courteous Reader with theſe following Advertiſements.

Firſt, That the Demonſtrations of my *Aſtronomia Carolina* have been long ſince Examined and Approved by Perſons really Judicious: And our way of finding the Aphelions of the Planets or the Apogæon of the Moon firſt, and their Nodes, *&c.* afterwards, and ſo reiterating the work as the Caſe requireth (unleſs all could be demonſtratively performed at once) is not to be eſteemed erroneous.

2. In my Diagram in *pag.* 35. in ſtead of the Angle B P E, I have purpoſely for variety of the Operation taken the Arch E B in the Moons Orbite; the difference in the Angle A ☊ B or the place of ☊ being neither ſenſible nor by any means obſervable.

3. In the bottom of my 31th *page*, and in my Example of Calculating the Suns Eclipſe from *pag.* 84 to 88, I take the Angle of the Vertical with the Ecliptick at the Center of ☉; which in regard that the Parallax of ☽ is alſo Computed according to her Viſible Altitude, ſuppoſing it the ſame with the Suns, can never cauſe any greater difference then ſome few ſeconds: and of this I have given ſome account in the top of *pag.* 90.

4. The firſt part of the *Æquation* of *Time* was by me firſt truly demonſtrated about the year 1654 or 1655. but by *Vincent Wing* never, though he hath conſtantly ever ſince made uſe of it: and though I had not then proceeded ſo far in thoſe Studies, as to diſcover the truth of the ſecond part, or perfect a matter of that difficulty, it is ſince (by Gods aſſiſtance) in my *Aſtronomia Carolina* and *Appendix* compleatly finiſhed.

And here I am neither willing, nor at leaſure to take notice of all the Abſurdities by *Wing* already publiſhed in his other books; But in the 19th of his 20 *Principles* (as he calls them) in the latter part of his Almanack for 1666, he ſaith, *That the proper Motion of the Earth upon her Axis is equal in reſpect of the Converſions of her Meridian to the Sun*: which is as much as to

ſay

ſay (though I verily believe he underſtands it not) That there is no Æquation or Difference between the Equal time and the Apparent.

5. Whereas in my Example for the Calculation of a Lunar Eclipſe in *Aſtronomia Carolina*, the Time of Reduction is there (according to the Method formerly uſed by moſt Aſtronomers) taken too little by ſome ſeconds, which comes by the omiſſion of the Augmentation of the Angle of the Viſible way of the Moon with the Ecliptick *in loco tranſitus Lunæ*, cauſed by the Motion of the Shadow and Nodes in that ſhort interval; the defect is in the end hereof (and no where elſe that I know of) abſolutely ſupplyed

But *Wing*, in the 40th *page* of his *Examen* tells us, That he hath ſome hopes of his Antagoniſt hereafter, though in the mean time I ſee no hopes he hath given of himſelf: And becauſe he fears no Bug-bears, and is ſo excellently ſelf-conceited, as his own words do there demonſtrate; I oppoſe this little unto all that himſelf or his aſſiſtants have ſaid, or for the future can ſay or write to the contrary.

Yet if his ſo much boaſted of *Aſtronomia Britannica*, or rather *North-Luffenham-enſis* comes forth in any time, and I have occaſion to make uſe of his *Aliquod dictum quod non dictum prius*, perhaps I may in few words reſolve him the queſtion, whether I underſtand his *Latine* any better then he doth either *Aſtronomy* or himſelf. No more here of *V. W.*

But in regard that the afore-treated of *Tranſit* of ☿ *ſub Sole Anno* 1674. *April* 27 *manè* falleth wholly below our Horizon; I ſhall add the Calculation of the next that may be obſerved in *England*, which according to my *Aſtronomia Carolina* is *Anno* 1677. *October* the 28th. ☉ and ☿ being Conjoyned in ♏ 15°. 42′. 34″. And at *London*,

	d	h	′	″	Lat. ☿ North
The equal Time of true ☌.	28.	0.	57.	34	
The Æquation of Time. Add			3.	46	
The Apparent Time of true ☌	28.	1.	1.	20	4′. 39″.
The Interval Subſtract.			6.	43	
The Middle of the Eclipſe	28.	0.	54.	37	4.33. Cent. Diſt. 4′ 36″.
The Half-Duration			2.	35.	43
The Central Ingreſs	27.	22.	18.	54	2. 21
The Central Egreſs	28.	3.	30.	20	6. 46

The Angle of the Viſible way of ☿ with the Ecliptick, is 8°. 14′. The Semidiameter of ☉ 16′. 6″. and the Semidiameter of ☿ 7″.

The Parallax of ☿ from ☉ in this and the former ☌, I have purpoſely omit-

omitted in my calculation, as being very ſmall, &c. Yet after accurate Obſervation hath been made, it may be eaſily found by my *Aſtronomia Carolina*, and applyed as the Caſe requireth.

Many more ſuch rarities may in this following Century of years preſent themſelves to the view of Induſtrious Obſervators. But the next Appearance of ♀ within the Viſible *Diſcus* of the *Sun* is not till the *Year* 1761. *May* the 26 h. The true ☌ happening in ♊. 15° 46′. 48″. And (leaving the Parallax to be computed to the Place where the Obſervation ſhall be made) The *Apparent Time* in reſpect of our Meridian is as followeth.

	d	h	′	″	Lat. ♀ South.
The true ☌ of ☉ and ♀ *May.*	25.	23.	5.	0	6′. 56″
The Interval Subſtract		0.	15.	21	
The Middle of the Eclipſe	25.	22.	49.	39	6. 47. Cent. Diſt. 6′. 51″
The Half-Duration		3.	30.	20	
The Central Ingreſs	25.	19.	19.	19	4. 42.
The Central Egreſs	26.	2.	19.	59	8. 52

The next following Tranſit of *Venus* between the *Earth* and *Sun*, is *Anno* 1769. *May* 24th in the Morning. The true ☌ in ♊. 13°. 46′. 28″. And (according to our former Method) The *Apparent Time* of

	d	h	′	″	Lat. ♀ North.
The True ☌ of ☉ and ♀. *May*	23.	15.	47.	51.	13′. 11″
The Interval Add		0.	29.	20	
The Middle of the Eclipſe.		16.	17.	11	12. 54. Cent. Di. 13′. 2″
The Half-Duration		2.	10.	36	
The Central Ingreſs		14.	6.	35	14. 11.
The Central Egreſs		18.	27.	47	11. 36.

And in both theſe laſt mentioned Tranſits, The *Angle* of the *Geocentrick Viſible way* of ♀ with the *Ecliptick*, is 8°. 31′. The Semidiameter of ☉ 15′. 40″. and the Semidiameter of ♀ 36″.

A Table of the Angle which the true Motion of the Moon from the Sun makes with the Ecliptick in Lunar Eclipses.

Arg. Lat.	True Hourly Motion of the Moon from the Sun.											Arg. Lat.
Sig. 0 / Sig. 6	27′	28′	29′	30′	31′	32′	33′	34′	35′	36′	Sig. 5 / Sig. 11	
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′		
6 0	5 46	5 45	5 44	5 43	5 42	5 41	5 40	5 39	5 38	5 37	30	6
1	5 46	5 45	5 44	5 43	5 42	5 41	5 40	5 39	5 38	5 37	29	
2	5 46	5 45	5 44	5 43	5 42	5 41	5 40	5 39	5 38	5 37	28	
3	5 46	5 45	5 44	5 43	5 42	5 41	5 40	5 39	5 38	5 37	27	
4	5 45	5 44	5 43	5 42	5 41	5 40	5 39	5 38	5 37	5 36	26	
5	5 45	5 44	5 43	5 42	5 41	5 40	5 39	5 38	5 37	5 36	25	
6	5 44	5 43	5 42	5 41	5 40	5 39	5 38	5 37	5 36	5 35	24	
7	5 44	5 43	5 42	5 41	5 40	5 39	5 38	5 37	5 36	5 35	23	
8	5 43	5 42	5 41	5 40	5 39	5 38	5 37	5 36	5 35	5 34	22	
9	5 42	5 41	5 40	5 39	5 38	5 37	5 36	5 35	5 34	5 33	21	
10	5 41	5 40	5 39	5 38	5 37	5 36	5 35	5 34	5 33	5 32	20	
11	5 40	5 39	5 38	5 37	5 36	5 35	5 34	5 33	5 32	5 31	19	
12	5 39	5 38	5 37	5 36	5 35	5 34	5 33	5 32	5 31	5 30	18	

A Table of the Time of Reduction between the true Opposition of the Luminaries and the Greatest Oscuration or Middle of the Moons Eclipse.

Arg. Lat.	Substract from the time of the true ☍ of ☉ and ☽ in her Orbite.											Arg. Lat.
	True Hourly Motion of the Moon from the Sun.											
Sig. 0 / Sig. 6	27′	28′	29′	30′	31′	32′	33′	34′	35′	36′	Sig. 5 / Sig. 11	
	h ′ ″	h ′ ″	h ′ ″	h ′ ″	h ′ ″	h ′ ″	h ′ ″	h ′ ″	h ′ ″	h ′ ″		
6 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	30	6
1	0 35	0 34	0 33	0 31	0 30	0 29	0 28	0 27	0 26	0 26	29	
2	1 10	1 7	1 5	1 3	1 0	0 58	0 56	0 55	0 53	0 51	28	
3	1 45	1 41	1 37	1 34	1 30	1 27	1 25	1 22	1 19	1 17	27	
4	2 20	2 15	2 10	2 5	2 0	1 56	1 53	1 49	1 45	1 42	26	
5	2 55	2 48	2 42	2 36	2 30	2 25	2 21	2 16	2 12	2 8	25	
6	3 29	3 21	3 14	3 7	3 0	2 51	2 48	2 43	2 38	2 33	24	
7	4 4	3 54	3 46	3 38	3 30	3 23	3 16	3 10	3 4	2 58	23	
8	4 38	4 27	4 17	4 8	3 59	3 51	3 43	3 36	3 29	3 23	22	
9	5 11	5 59	4 48	4 38	4 28	4 19	4 10	4 2	3 54	3 47	21	
10	5 44	5 31	5 19	5 7	4 56	4 46	4 37	4 28	4 19	4 11	20	
11	6 17	6 3	5 49	5 37	5 25	5 14	5 3	4 53	4 44	4 35	19	
12	6 50	6 34	6 19	6 6	5 53	5 41	5 29	5 19	5 9	4 59	18	

Add to the time of the true ☍ of ☉ and ☽ in her Orbite — Arg. Lat.

FINIS.

Post-script.

For the more speedy Use of the Planetary and Lunar Systemes.

For the true places of the Primary Planets.

1. TO the given time, gather the Middle-Motion of the Earth and also of the other Primary Planet or Planets whose places are required, from the first Star of *Aries*; for which purpose, this following little Table is here added, to be used in stead of that of the Mean Anomaly of each Planet to the radical years of Christ in the former part of the *9th* page: and for the Residue of years, with the Month, Day and Hour, take the Mean-Anomalies as you find them in the *9th*, *10th*, and *11th* pages, for they are the same as the Middle-Motions from the first Star of *Aries*.

An. Chr. Curren.	*M.M.* ☉ à ♓ ♈	*Pac. Æq.*	♄	*Motus Medius* à ♓ 1. ♈ ♃	♂	♀	☿
1	2576	144	1943	4822	929	1039	8910
1601	2288	767	5021	3697	7754	8975	984
1661	2277	790	5368	4279	6760	4272	2187
1681	2273	798	2175	1140	3095	9371	2588
1701	2270	806	8963	8001	9430	4471	2989
1721	2266	813	5752	4862	5765	9570	3390
1741	2262	821	2540	1723	2101	4669	3791
1761	2259	829	9329	8584	8436	9768	4192
1781	2255	837	6117	5445	4771	4867	4593
1801	2252	844	2906	2306	1107	9967	4994
1901	2234	883	6848	6610	2783	5463	6998
2001	2216	922	790	915	4460	958	9003

This belongs to the planetary System, which is bound with Transl. beginning with number 22.

2. Lay one side of your Rule or Sector by the Center of the Systeme, and by the aforegathered Middle Motion of the Earth found in the outermost divided Circle: And take a flat pair of Compasses fitted for this business, laying one side of them by the afore-mentioned side of the Rule, and opening them so as to bring their foot or point on the other side exactly to the Focus of the Earths Middle-Motion in her larger Ellipsis; then sliding the Compasses along by the same side of the Rule toward the aforesaid Middle-Motion in the outermost Circle, the motion of the said point passing in a Parallel to the Rule, shall cut the true place of the Earth in her said larger Ellipsis; by which drawing forth the thread from the Center of the Systeme, it shall cut the *Heliocentrick* Longitude of the Earth from the first Star of *Aries*, in either of the two outermost Circles.

And in like manner may you easily find the *Heliocentrick* Longitude of ♄, ♃, ♂, ♀ or ☿, first correcting the Middle-Motion of ♂ or ☿ by Variation according to their *Mean-Anomaly*, as in Page 12. And here, if you substract the fixt place of the *Aphelion* of the Planet from his Middle-Motion from the first Star of *Aries*, the remainer is his *Mean-Anomaly*.

3. Also for the *Geocentrick* Longitude of any of the said five Planets, lay the side of your Rule by the Places of ♄ or ♃, in their Ellipsis, and of the Earth in her lesser Ellipsis; but by the places of ♂, ♀ or ☿, and of the Earth in their larger Ellipsis: Then by the said side of your Rule, laying one side of your Compasses, open them so that their foot or point on the other side shall pass by the Center of the Systeme or fixed place of the Sun, and slide them along by the Rule the same way that passeth from the Earth to the other Planet: So the Motion of the last mentioned foot or point of the Compasses, shall cut the *Geocentrick* Sidereal-Longitude of the said Planet in the outermost Circles.

4. For the Latitude of ♄, ♃, ♂, ♀ or ☿, Substract the fixt place of the neareſt *Node* of the Planet, from the *Heliocentrick Sydereal-Longitude* of the said Planet, or contrarily this from

from that, so that the Remainer may not exceed three Signes; this remainer (in *page* 12) gives the *Heliocentrick Latitude*, by which, and the Distances of the Planet from the Earth and Sun, you may easily find the *Geocentrick Latitude* of the Planet, as is shewn in the *Example* of ♂, *Page* 6.

For the true Place of the Moon,

The Work by the Rule and Compasses afore-mentioned, differeth from that which is afore-delivered on the *Systeme* of the Moon, onely in the *5th. and 6th.* Precept, *Page* 20; and is thus:

Lay one side of your Rule by the Center of the *Systeme*, and also by the *Mean-Anomaly* of the Moon found in the out-most divided Circle, and by the said side of your Rule, lay one side of your Compasses, bringing their foot or point on the other side exactly to the *Focus* of the *Middle-Motion*, then slide them along the Rule towards the said *Mean-Anomaly* in the divided Circle; so the Motion of the said point shall cut the Æquated place of the Moon in her *Ellipsis*; by which last found Section, and by the other *Focus* representing the Center of the Earth, lay one side of your Rule, and by this, one side of your Compasses, bringing their foot or point on the other side to pass by the Center of the *Systeme*, and sliding them by the said *Æquated* place, the Motion of the said Point shall cut the *Æquated-Anomaly* of the Moon in both the divided Circles; to which *Æquated-Anomaly*, add the true *Apogeon*, and the Sum shall be the *Æquated* place of the Moon.

Next for the Variation, by help of the little Circle now placed above the *Apog.* The Parallel to the Line of the *Apog.* found as in *Page* 20, *Precept* 6, shall cut the Circle in which the Center of the said little one is placed, in a certain point, by which drawing the thread from the Center of the *Systeme*, the Arch in the divided Circle intercepted betwen this thread and the Line of the *Apogeon*, is equal to the *Variation*, which is to be applyed as in the latter end of the said *6th Precept.*

Further

Further *Examples* are here needleſs: Onely obſerve, That for the uſe above mentioned, a Parallel may be eaſily ſet off ſeveral other wayes without Compaſſes, as by help of a plain *Rectangle* of Braſs, or Box, *&c.* and a black-lead Pen.

TOuching the Extract of Mr. Flamſteed's *Letter of* November 25. 1674. *written to Mr.* Collins, *and publiſhed in the* Philoſophical Tranſactions, Numb. 110. *the Reader may take notice, That in my* Lunar Syſteme *(which Mr.* Flamſteed *calls* Moon-Wiſer) *the greateſt* Æquation *of the* Apogeon, *differeth about* 22′ *from that of the Ingenious Mr.* Horrox (*the ſhortneſs of whoſe life may be for ever lamented*) *nor is my greateſt or leaſt* Eccentricity, *nor yet my* Reflection *of* ☽ *the ſame with his; all which, with my taking of the* Elliptick Æquations *of the* Moon *according to the* Hypotheſis *of the Learned Doctor* Seth Ward, *now Lord Biſhop of* Saliſbury, *and not that of* Horrox, *muſt needs cauſe ſeveral differences of minutes in her Longitude; neither were any of my* Middle-Motions *taken from his, or Mr.* Flamſteed's *Explication, as may be ſoon tried to any large intervals of time, by help of my Table for Converſion of Signs and Degrees,* &c. *in Page* 18. *As for the Mechanick work of the Syſteme, I doubt not but it may be eaſily performed, if not exactly to one tenth, yet to much leſs than half a degree; but however, I am very well aſſured, that my explanation and correction of the* Theory *of* Horrox, *is not altogether needleſs or impertinent: And though I believe I know as well as Mr.* Flamſteed, *and perhaps knew before he did, how to reſolve any proportion in* Triangles Mechanically, *unto leſs than one ſingle minute, I ſhall rather chooſe to do it by numbers, and have great reaſon to ſuſpect, that it muſt be ſome other kind of* Moon-Wiſer *than he hath yet contrived, that ſhall ſhew her true place at all times unto one or two minutes. Thus much in oppoſition to the Untruths in the ſaid Extract of Mr.* Flamſteed's *Letter.*

2. *Junii*, 1675. Thomas Streete.